

A Monte Carlo Analysis of the Thrust Imbalance for the RSRMV Booster
During Both the Ignition Transient and Steady State Operation

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This paper presents the results of statistical analyses performed to predict the thrust imbalance between two solid rocket motor boosters to be used on the Space Launch System (SLS) vehicle. Two legacy internal ballistics codes developed for the Space Shuttle program were coupled with a Monte Carlo analysis code to determine a thrust imbalance envelope for the SLS vehicle based on the performance of 1000 motor pairs. Thirty three variables which could impact the performance of the motors during the ignition transient and thirty eight variables which could impact the performance of the motors during steady state operation of the motor were identified and treated as statistical variables for the analyses. The effects of motor to motor variation as well as variations between motors of a single pair were included in the analyses. The statistical variations of the variables were defined based on data provided by NASA's Marshall Space Flight Center for the upgraded five segment booster and from the Space Shuttle booster when appropriate. The results obtained for the statistical envelope are compared with the design specification thrust imbalance limits for the SLS launch vehicle.